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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,780	09/28/2007	Jeremy Stephen Matcham	17638-008US1 INTEU/P31704	7827
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EXAMINER				
HAN, KWANG S				
ART UNIT		PAPER NUMBER		
1727				
NOTIFICATION DATE		DELIVERY MODE		
03/03/2011		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATDOCTC@fr.com

# Office Action Summary

**Application No.**

10/584,780

**Applicant(s)**

MATCHAM ET AL.

**Examiner**

Kwang Han

**Art Unit**

1727

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 17-27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 9/22/06
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_.

**WATER MANAGEMENT IN FUEL CELLS**

Examiner: K. Han    SN: 10/584,780    Art Unit: 1727    February 28, 2011

***Election/Restrictions***

1.     Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-16, drawn to a method of operating an electrochemical fuel cell.

Group II, claim(s) 17-27, drawn to electrochemical fuel cell assembly.

2.     The groups of inventions listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The common technical feature between the two groups is a fuel cell assembly with fuel flow channels within the anode, cathode, and delivering a sufficient quantity of liquid water to the flow channels within the cathode. This is not a special technical feature because Breault et al. (US 6316135) discloses a fuel cell assembly with fluid flows channels for the anode, cathode, and delivering sufficient quantity of liquid water to the flow channels within the cathode [Abstract] (9:33-64) therefore a lack of unity exist between the groups *a posteriori*.

3. During a telephone conversation with Paul Pysher on February 17, 2011 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-16. Affirmation of this election must be made by applicant in replying to this Office action. Claims 17-27 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Claim Rejections - 35 USC § 112***

4. Claims 1-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, the use of the term "substantially" makes it unclear and indefinite as to what portion of the fluid flow channels meet the limitations.

Regarding claims 4, 9, 10, 11, and 12, the use of the term "water factor" is unclear and indefinite as this parameter is not readily recognized. For the purposes of examination any apparatus that provides a sufficient quantity of water will be defined as providing the "water factor" required.

All claims dependent are also rejected for the same.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1-3 and 7-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brambilla et al. (WO 00/63992) in view of St-Pierre et al. (US 2003/0186093).

Regarding claims 1, 2, and 9-12, Brambilla discloses a method of operating a fuel cell having an anode, an ion transfer membrane, and a cathode comprising distributing the gaseous reactants (delivering fluid fuel and oxidant to flow channels), manifolds used to discharge reactants (8:4-25; Example 1, 5), and liquid water provided to the fluid flow channels (11: 21-25; Claim 1) to provide a flow rate so as to maximize the voltage of the single cells (12:3-4) but it does not explicitly teach a relative humidity of 100% being maintained throughout the fluid flow channels.

St-Pierre teaches a fuel cell which provides sufficient water to the stack to keep the membrane wet and ionically conductive by maintaining the relative humidity at 100% which defines a boundary between drying and wetting conditions [0050, 0078]. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide a relative humidity of 100% in the fuel cell of Brambilla because St-Pierre recognizes this humidity level keep the membrane wet and ionically conductive.

Regarding claim 3, Brambilla discloses a fuel cell stack (30; Figure 1).

Regarding claims 7 and 8, Brambilla is silent towards the calibration function determined for air stoichiometry.

St-Pierre teaches a number of stack operating parameters can be adjusted to change the operating conditions of a fuel cell including oxidant and fuel stoichiometries which can be adjusted so that the fuel cell operation is changed from a wetting condition to a drying condition or water balance [0078, 0083] with a specific example of an air stoichiometry of 1.8. It would have been obvious to one of ordinary skill in the art at the time of the invention to vary the air stoichiometry of Brambilla because St-Pierre recognizes the air stoichiometry affects the wetting condition of the membrane. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to vary the air stoichiometry since it has been held that discovering the optimum ranges for a result effective variable such as air stoichiometry involves only routine skill in the art in the absence of showing of criticality in the claimed range (MPEP 2144.05) In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claims 13 and 14, Brambilla is silent towards a method comprising temporarily permitting delivery of water such that the relative humidity less than 100% is maintained below a sub-optimal operating temperature.

St-Pierre teaches that excess accumulated water which can block flow channels is not desired if the temperature of the fuel cell stack is to be cold started or below 0°C and is remedied by operating the fuel cell in a drying condition for a period of time [0082]. It would have been obvious to one of ordinary skill in the art at the time of the

invention to operate the fuel cell of Brambilla in a drying condition when the fuel cell stack is cold because St-Pierre teaches this allows for excess accumulated water to be removed so it does not block flow channels if the water freezes.

Regarding claims 15 and 16, Brambilla is silent towards the flow rate being controlled so that the liquid water in all regions of the fuel cell can be evaporated in the prevailing temperature and pressure conditions.

St-Pierre teaches that the humidification control for the fuel cell is dependant upon the water vapor saturation which is dependant upon temperature and pressure considerations at the fuel/oxidant inlet and outlets so that the wetting condition of the membrane is properly hydrated and excess accumulated water is not present [0050, 0078-0083]. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide water for humidification at a rate considering the temperature and pressure within the fuel cell of Brambilla because St-Pierre teaches these parameters affect the water vapor saturation which allows for proper hydration yet limiting excess water being present in the fuel cell.

8. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brambilla et al. and St-Pierre et al. as applied to claim 1 above, and further in view of Nonobe (US 6524733).

The teachings of Brambilla and St-Pierre as discussed above are herein incorporated.

Regarding claims 4-6, Brambilla and St-Pierre are silent towards increasing the quantity of water delivered as a function of fuel cell current and determining a calibration function based on current.

Nonobe teaches a fuel cell system that determines a precise condition of the humidification of the electrolyte membrane of the fuel cell based on the current and voltage of the fuel cell so that adjustments (calibration function) can be performed so that the humidification of the electrolyte membrane remains within a proper range [Abstract] (2:3-46). It would have been obvious to one of ordinary skill in the art at the time of the invention to determine and control the condition of the humidification of the electrolyte membrane of Brambilla and St-Pierre because Nonobe teaches this provides precise condition information to maintain the humidification in a proper range.

#### ***Contact/Correspondence Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kwang Han whose telephone number is (571) 270-5264. The examiner can normally be reached on Monday through Friday 8:00am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on (571) 272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. H./  
Examiner, Art Unit 1727

/Dah-Wei D. Yuan/  
Supervisory Patent Examiner, Art Unit 1727